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More Than Skin Deep: Judgments of Individuals With Facial Disfigurement

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People's physical appearance can have a profound impact on their social interactions. Faces are often the first thing we notice about people and the basis on which we form our first impressions of them. People with facial disfigurement are discriminated against throughout their lives. Currently, we do not know why this discrimination occurs. In order to develop viable interventions, we must first understand the nature of people's reactions to disfigurement. In this work, we tested the hypothesis that a "disfigured is bad" stereotype exists, wherein people attribute negative characteristics to individuals with facial disfigurement. People made judgments of individuals before and after they received corrective treatment for their disfigurement. Observers reported lower emotional valence (i.e., more negative emotion), higher arousal, and lower dominance when viewing pretreatment (vs. posttreatment) photographs. Moreover, pictured pretreatment individuals were viewed significantly more negatively in terms of personality (e.g., emotional stability, conscientiousness), internal attributes (e.g., happiness, intelligence), and social attributes (e.g., trustworthiness, popularity). These subjective judgments further reduced to people with disfigurement being regarded as less sociable and happy, less dominant, less emotionally stable, and more as objects of curiosity compared with those with corrected facial disfigurement. Our findings suggest that negative stereotype of people with facial disfigurement may drive discrimination in social, academic, and professional contexts. Knowing what inferences people draw on the basis of disfigurement will make it possible to design interventions to improve the way people with disfigurement are viewed and ultimately treated by others.

Keywords: disfigurement, physical appearance, attractiveness, prejudice, stereotype

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During World War I, an estimated 20,000 people suffered from facial disfigurements (Alexander, 2007). They were typically shunned. For example, one hospital in Sidcup, United Kingdom, treating people with facial disfigurements installed blue benches for such patients so that others would know their location and could avoid looking at them (Alexander, 2007). A surgeon treating disfigured soldiers wrote, "The psychological effect on a man who must go through life, an object of horror to himself as well to others, is beyond description" (Albee, 1950, p. 138). One hundred years later, we still do not know what drives society's discrimination against people with disfigurement, nor have we developed interventions to counter this treatment.

Considerable work confirms a "beauty is good" stereotype (Dion, Berscheid, & Walster, 1972), wherein positive characteristics are attributed on the basis of beauty. Attractive people are regarded as more socially competent, dominant, better adjusted, more capable in school and work, and receive greater rewards and lesser punishments (for meta-analyses, see Eagly, Ashmore, Makhijani, & Longo, 1991; Langlois et al., 2000). By contrast, we have little understanding of the social effects of facial disfigurement. Here, we test the hypothesis that a "disfigured is bad" stereotype exists, wherein we attribute negative characteristics to people with disfigurements.

Facial disfigurements are common. Approximately 1% of the U.K. population is affected by significant facial disfigurement (Julian & Partridge, 2007). In order of frequency, their causes are

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skin conditions (e.g., vitiligo), paralysis, congenital conditions (e.g., cleft palate), accidents (e.g., burns), and cancer. Acquired disfigurements are on the rise, with head and neck cancers appearing increasingly in younger adults (Young et al., 2015).

Rates of disfigurement vary across societies and within subgroups. In Bangladesh, acid thrown at the face of a victim produces a significant number of disfigurements. Between 1999 and 2015, 3,302 attacks occurred, with most of the victims women (Acid Survivors Foundation, 2016). In war-torn areas, people sustain severe facial injuries and burns from guns or explosives. In Iraq and Afghanistan, improvised explosive devices (IEDs) have caused devastating facial injuries. Between 2003 and 2011, 7,200 U.S. soldiers stationed in the area sustained head and neck injuries, and IEDs were responsible for over 70% (Brennan, 2015). Understanding the impact of facial disfigurement has become an increasingly pressing issue, as the rate of head and neck injury in recent wars is higher than in World War II, Korea, and Vietnam wars (Owens et al., 2008).

People with facial disfigurement experience discrimination (for reviews, see Rumsey & Harcourt, 2004; Thompson & Kent, 2001). Children with disfigurement receive less maternal nurturing and are bullied by other children (Barden, Ford, Jensen, Rogers-Salyer, & Salyer, 1989; Walters, 1997). They are discriminated against in academic contexts (Richman, 1978; Walters, 1997) and, later, in professional environments (Lanigan & Cotterill, 1989; Porter, Beuf, Lerner, & Nordlund, 1986; Sarwer et al., 1999; Stevenage & McKay, 1999; Tartaglia, McMahon, West, & Belongia, 2005). Adults with disfigurement are avoided (Houston & Bull, 1994; Macgregor, 1990; Rumsey, Bull, & Gahagan, 1982) or stared at and are often subject to rude comments from strangers (Macgregor, 1990; Porter et al., 1986; Sarwer et al., 1999). They report difficulties making friends and establishing romantic relationships (Lanigan & Cotterill, 1989; Rumsey & Harcourt, 2004; Sarwer et al., 1999).

As an individual example of these difficulties and discrimination, consider Ronny Porta, an American veteran of the Iraq War (Zoraya & Gomez, 2013). While serving in 2007, an IED blast burned his body and face. Over the subsequent 5 years, he underwent 128 surgeries to attempt to reconstruct his mouth, nose, and the skin on his face. When he first looked in the mirror, Porta reported, "I couldn't see myself. I thought, 'Who's going to love me now?'" (Zoraya & Gomez, 2013, Paragraph 32). When out in public, he faces constant stares, mocking, and personal, inappropriate questions:

> Two months ago, a man approached Porta in a Home Depot. He stood studying the burns on Porta's face and asked if a car accident was to blame. Porta, wearing a Marine Corps sweatshirt, said, no, it was an IED explosion in Iraq. What really stuck with Porta and angers him still were the words the man said next: "Was it worth it?" (Zoraya & Gomez, 2013, Paragraph 5-6)

What can be done to improve the way that Porta and others are treated? Despite calls to study the nature of people's reactions to disfigurement in order to inform possible interventions (Thompson & Kent, 2001), research to date has been sparse. Previous attempts to gather first impressions of people with disfigurements have been limited by the use of photo-editing software to create or eliminate disfigurements in stimuli shown to participants (e.g., Masnari, Schiestl, Weibel, Wuttke, & Landolt, 2013; Mojon-Azzi, Potnik, & Mojon, 2008; Rankin & Borah, 2003; Tobiasen, 1987). These studies suggest that people with disfigurements are viewed as less likable, popular, intelligent, and trustworthy. However, given the artificial stimuli of these studies, it is unclear whether the differences in the attributions were because of the disfigurement or because the manipulations rendered the faces unnatural.

We sought to determine whether people's judgments would be biased against individuals with facial disfigurement using well-controlled natural stimuli. We predicted that individuals who had received treatment for their disfigurement would be perceived as having more positive personalities, internal, and social attributes than disfigured (i.e., pretreatment) individuals. We also examined the effects of gender of the faces viewed and of the observers making judgments.

Previous findings on the effect of face gender have been mixed. Some studies have found that women with facial disfigurement are more distressed (e.g., Carr, Harris, & James, 2000), perhaps because of society's greater emphasis on women's appearance and their loss of identity within society (Andreasen & Norris, 1972). However, other studies have failed to find any gender differences (e.g., de Graeff et al., 2000). In the current study, we examined whether face gender had any relationship to the kind of inferences that observers make about the pictured person, which might contribute to their reactions and to the disfigured person's distress.

Research on observers' reactions to emotional stimuli suggests that women react more strongly than men (e.g., Bradley, Codispoti, Sabatinelli, & Lang, 2001; Lithari et al., 2010). Specifically, women's arousal tends to be higher and valence lower in response to unpleasant and highly arousing images. One explanation for these findings is that women are particularly responsive to stimuli that may be indicate danger (i.e., unpleasant and arousing; Williams & Gordon, 2007).

Previous research on inferences made on the basis of disfigurement (e.g., Masnari et al., 2013; Mojon-Azzi et al., 2008; Rankin & Borah, 2003; Tobiasen, 1987) has failed to find an effect of observer gender with smaller sample sizes. Here, using a larger sample size and adding measures of emotional reaction, we examined whether observers' gender affected their emotional reactions to individuals with disfigurement and the inferences made based on disfigurement.

Method

Participants

Participants (N = 145, 62 female, mean age = 35.39) were recruited online through Amazon Mechanical Turk. An additional 14 participants were tested but excluded from further analyses for failing more than two of four attentional catch trials. The sample size had power of approximately 80% to detect an effect size of $d = .5$ at $p = .05$, representative of effects in earlier studies (e.g., Masnari et al., 2013).

Materials

Materials consisted of 26 sets of pictures of faces (one face pretreatment, one face posttreatment) collected from craniofacial and dental surgery atlases and compilations of plastic surgery results (see Table 1 of the online supplemental materials for details). The pretreatment faces were affected by one of the fol-

lowing disfigurements: carcinoma, hyperpigmentation, birthmark, scar or small wound, facial paralysis, isolated weight loss, bone disfigurement, or facial trauma. Pretreatment and posttreatment pictures were chosen to have matched facial expressions, when possible, and cropped and color-corrected to match in size and coloring. Figure 1 provides two example pairs.

The Self-Assessment Manikin (SAM; Bradley & Lang, 1994) was used to gather information about how seeing the faces made people feel. The SAM is a pictorial scale used to gather people's self-reported emotional reactions in response to stimuli. It consisted of three 9-point visual scales for Valence (unhappy vs. happy), Arousal (low vs. high), and Dominance (low control vs. high control; 9-point scale variation from Irtel, 2007).

A series of 30 5-point semantic differential scales were used to gather people's perceptions of the pictured individuals. Ten scales (adapted from the Ten Item Personality Inventory; Gosling, Rentfrow,

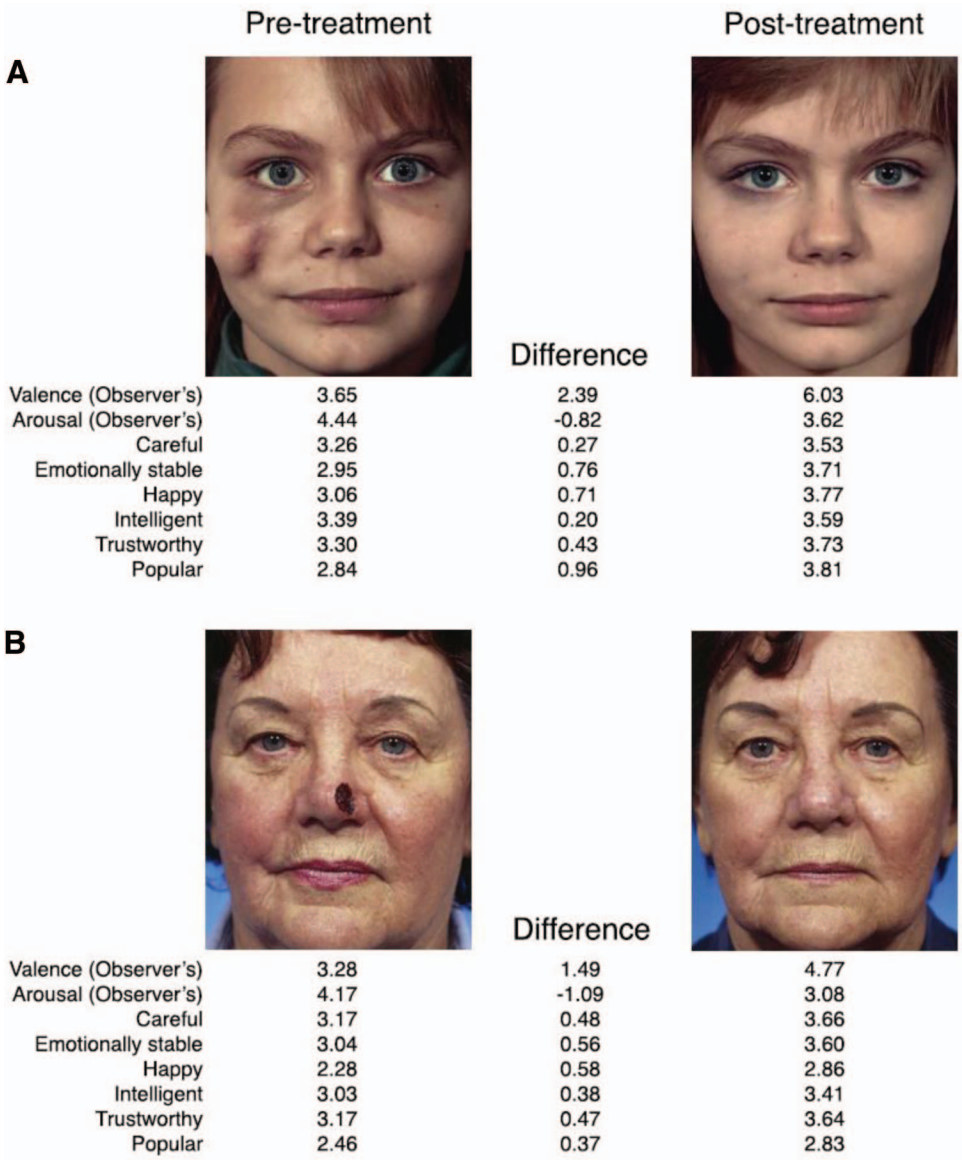

Figure 1. Two example pairs of faces pre- and posttreatment. Estimates for each face are derived from models estimating the effect of treatment on observers' ratings. These models included by-item (i.e., face) intercept and slope estimates. People reported higher valence and lower arousal when viewing posttreatment than pretreatment individuals, and made more positive inferences about posttreatment individuals' personality traits (e.g., conscientious, emotionally stable), internal attributes (e.g., happy, intelligent), and social attributes (e.g., trustworthy, popular). Figure 1A Reprinted from Local flaps in facial reconstruction (p. 757), by Shan R. Baker, 2014, Philadelphia, PA: Elsevier. Copyright 2014 by Elsevier. Figure 1B Reprinted from Local flaps in facial reconstruction (p. 208) by Shan R. Baker, 2014, Philadelphia, PA: Elsevier. Copyright 2014 by Elsevier. See the online article for the color version of this figure.

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Table 1
Fixed Effect Regression Coefficients and Standardized Coefficients for Models Estimating the Effect of Treatment (Pre- vs. Posttreament) on SAM Measures, Personality Trait Ratings, Internal Attribute Ratings, Social Attribute Ratings, and Attractiveness

Measure	*B*	*SE B*	β	*t*	*p*	Bonferroni corrected p value significant	Treatment	95% CI Lower limit	95% CI Upper limit
SAM measures (1–9 scale)									
Valence									
Intercept	4.98	.20	.38	25.54	<.001	*	Posttreatment	4.60	5.36
Treatment (Pre)	−1.20	.16	−.75	−7.31	<.001	*	Pretreatment	3.49	4.07
Arousal									
Intercept	3.45	.12	−.16	29.86	<.001	*	Posttreatment	3.22	3.68
Treatment (Pre)	.56	.13	.31	4.38	<.001	*	Pretreatment	3.74	4.26
Dominance									
Intercept	5.05	.14	.11	34.93	<.001	*	Posttreatment	4.77	5.33
Treatment (Pre)	−.36	.08	−.22	−4.64	<.001	*	Pretreatment	4.43	4.94
Personality traits (1–5 scale)									
Extraverted (vs. Introverted)									
Intercept	3.05	.14	.21	22.38	<.001	*	Posttreatment	2.79	3.32
Treatment (Pre)	−.46	.09	−.41	−5.03	<.001	*	Pretreatment	2.40	2.78
Outgoing (vs. Reserved)									
Intercept	3.00	.15	.19	20.48	<.001	*	Posttreatment	2.71	3.28
Treatment (Pre)	−.45	.10	−.38	27.20	<.001	*	Pretreatment	2.35	2.75
Careful (vs. Careless)									
Intercept	3.40	.06	.16	54.87	<.001	*	Posttreatment	3.28	3.52
Treatment (Pre)	−.33	.06	−.32	−6.04	<.001	*	Pretreatment	2.93	3.21
Reliable (vs. Unreliable)									
Intercept	3.40	.09	.13	39.37	<.001	*	Posttreatment	3.23	3.57
Treatment (Pre)	−.25	.08	−.24	−3.16	.004		Pretreatment	3.00	3.30
Emotionally stable (vs. Emotionally unstable)									
Intercept	3.34	.10	.21	33.51	<.001	*	Posttreatment	3.14	3.53
Treatment (Pre)	−.42	.09	−.41	−4.83	<.001	*	Pretreatment	2.78	3.06
Anxious (vs. peaceful)									
Intercept	2.89	.09	−.18	31.41	<.001	*	Posttreatment	2.71	3.07
Treatment (Pre)	.37	.08	.35	4.72	<.001	*	Pretreatment	3.14	3.38
Warm person (vs. Cold person)									
Intercept	3.20	.14	.09	22.97	<.001	*	Posttreatment	2.93	3.47
Treatment (Pre)	−.20	.10	−.17	−1.97	.059		Pretreatment	2.81	3.20
Supportive (vs. Critical)									
Intercept	3.13	.13	.10	23.65	<.001	*	Posttreatment	2.87	3.39
Treatment (Pre)	−.22	.10	−.19	−2.15	.042		Pretreatment	2.74	3.09
Creative (vs. Uncreative)									
Intercept	3.05	.10	.09	29.41	<.001	*	Posttreatment	2.84	3.25
Treatment (Pre)	−.18	.08	−.18	−2.34	.026		Pretreatment	2.69	3.04
Open to new experiences (vs. not open to new experiences)									
Intercept	3.13	.13	.12	24.38	<.001	*	Posttreatment	2.88	3.38
Treatment (Pre)	−.25	.08	−.24	−3.13	.004		Pretreatment	2.69	3.07
Internal attributes (1–5 scale)									
Content (vs. Bitter)									
Intercept	3.15	.14	.20	22.92	<.001	*	Posttreatment	2.88	3.42
Treatment (Pre)	−.43	.10	−.38	26.20	<.001	*	Pretreatment	2.52	2.92
Angry (vs. Calm)									
Intercept	2.52	.11	−.13	22.31	<.001	*	Posttreatment	2.30	2.74
Treatment (Pre)	.27	.09	.25	3.16	.004		Pretreatment	2.63	2.96
Optimistic (vs. Pessimistic)									
Intercept	3.06	.14	.17	22.00	<.001	*	Posttreatment	2.79	3.34
Treatment (Pre)	−.37	.10	−.34	−3.70	.001	*	Pretreatment	2.49	2.89
Energetic (vs. Sluggish)									
Intercept	3.11	.10	.14	30.61	<.001	*	Posttreatment	2.91	3.31
Treatment (Pre)	−.26	.07	−.27	−3.76	<.001	*	Pretreatment	2.69	3.01
Happy (vs. Unhappy)									
Intercept	3.00	.18	.26	17.11	<.001	*	Posttreatment	2.66	3.35
Treatment (Pre)	−.61	.12	−.50	−4.88	<.001	*	Pretreatment	2.16	2.63
Competent (vs. Incompetent)									
Intercept	3.50	.08	.17	43.85	<.001	*	Posttreatment	3.34	3.65

(*table continues*)

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Table 1 (*continued*)

Measure	*B*	*SE B*	β	*t*	*p*	Bonferroni corrected p value significant	Treatment	95% CI Lower limit	95% CI Upper limit
Treatment (Pre)	−.32	.06	−.34	−5.04	<.001	*	Pretreatment	3.04	3.31
Intelligent (vs. Unintelligent)									
Intercept	3.37	.08	.15	44.73	<.001	*	Posttreatment	3.22	3.52
Treatment (Pre)	−.27	.06	−.29	−4.71	<.001	*	Pretreatment	2.95	3.25
Hardworking (vs. Lazy)									
Intercept	3.48	.07	.14	53.09	<.001	*	Posttreatment	3.36	3.61
Treatment (Pre)	−.25	.06	−.27	−4.05	<.001	*	Pretreatment	3.09	3.37
Sensitive (vs. Insensitive)									
Intercept	3.17	.09	.04	33.85	<.001	*	Posttreatment	2.99	3.35
Treatment (Pre)	−.08	.08	−.08	−1.01	.321		Pretreatment	2.92	3.26
Nice (vs. Mean)									
Intercept	3.32	.13	.12	25.26	<.001	*	Posttreatment	3.06	3.58
Treatment (Pre)	−.24	.10	−.22	−2.37	.025		Pretreatment	2.90	3.27
Honest (vs. Dishonest)									
Intercept	3.39	.09	.10	39.84	<.001	*	Posttreatment	3.23	3.56
Treatment (Pre)	−.20	.07	−.20	−2.81	.009		Pretreatment	3.05	3.34
Uptight (vs. Easy-going)									
Intercept	2.95	.13	−.06	23.39	<.001	*	Posttreatment	2.70	3.19
Treatment (Pre)	.13	.09	.11	1.44	.162		Pretreatment	2.91	3.24
Social attributes (1–5 scale)									
Confident (vs. Insecure)									
Intercept	3.23	.13	.26	25.25	<.001	*	Posttreatment	2.98	3.48
Treatment (Pre)	−.59	.10	−.50	−5.90	<.001	*	Pretreatment	2.46	2.81
Connected (vs. Lonely)									
Intercept	3.04	.14	.24	22.36	<.001	*	Posttreatment	2.78	3.31
Treatment (Pre)	−.54	.10	−.48	−5.60	<.001	*	Pretreatment	2.31	2.70
Dominant (vs. Submissive)									
Intercept	2.97	.08	.13	37.70	<.001	*	Posttreatment	2.81	3.12
Treatment (Pre)	−.27	.07	−.26	−3.81	<.001	*	Pretreatment	2.55	2.85
Interesting (vs. Uninteresting)									
Intercept	3.20	.10	.08	33.25	<.001	*	Posttreatment	3.01	3.39
Treatment (Pre)	−.16	.07	−.16	−2.44	.021		Pretreatment	2.88	3.19
Likeable (vs. Unlikeable)									
Intercept	3.34	.13	.14	25.57	<.001	*	Posttreatment	3.09	3.60
Treatment (Pre)	−.29	.09	−.27	−3.14	.004		Pretreatment	2.87	3.24
Popular (vs. Unpopular)									
Intercept	3.06	.14	.22	22.42	<.001	*	Posttreatment	2.79	3.33
Treatment (Pre)	−.48	.09	−.44	−5.16	<.001	*	Pretreatment	2.40	2.76
Trustworthy (vs. Untrustworthy)									
Intercept	3.34	.09	.14	36.79	<.001	*	Posttreatment	3.16	3.51
Treatment (Pre)	−.27	.08	−.27	−3.38	.002		Pretreatment	2.90	3.23
Attractive (vs. Unattractive)									
Intercept	2.92	.14	.26	20.20	<.001	*	Posttreatment	2.63	3.20
Treatment (Pre)	−.56	.09	−.51	−6.04	<.001	*	Pretreatment	2.16	2.55

Note. Coefficients reaching a Bonferroni-corrected *p* value ($p < .0015$ for 33 dependent variables) are marked with an asterisk. SAM = Self-Assessment Manikin; *SE* = standard error; CI = confidence interval.

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& Swann, 2003) assessed personality attributes (e.g., introverted vs. extraverted; emotionally stable vs. emotionally unstable), 12 scales assessed internal attributes (e.g., unhappy vs. happy, lazy vs. hardworking), and seven scales assessed social attributes (e.g., submissive vs. dominant, unlikeable vs. likable). Twenty-three of the 30 scales used in this study were adapted from prior studies testing observers' perceptions of individuals with disfigurements and disabilities (Edwards, Topolski, Kapp-Simon, Aspinall, & Patrick, 2011; Fellinghauer, Roth, Bugari, & Reinhardt, 2011; Masnari et al., 2013; Mojon-Azzi et al., 2008; Rankin & Borah, 2003; Schneiderman & Harding, 1984; Tobiasen, 1987; see Table 2 of the online supplemental materials). In these studies, participants rated images of individuals who were photographed to reveal or not reveal their disability (Fellinghauer et al., 2011), rated images of an actor with a facial disfigurement before and after seeing a video of that actor engaged in a social situation (Edwards et al., 2011), rated their first impression of digitally altered images of faces with or without disfigurement (Masnari et al., 2013; Rankin & Borah, 2003; Tobiasen, 1987), or rated their first impression of images of faces with or without disfigurement (Schneiderman & Harding, 1984). As a manipulation check, we also included a scale to measure of attractiveness (unattractive vs. attractive).

Procedures

Participants were told that they would rate faces of individuals using different scales, which would appear after each face. No infor-

Table 2
Fixed Effect Regression Coefficients and Standardized Coefficients for Models Estimating the Effect of Treatment (Pre- vs. Posttreament) on Arousal and Dominance Ratings Separately for Male and Female Observers

SAM measure	*B*	*SE B*	β	*t*	*p*	Bonferroni sig.	Treatment	95% CI Lower limit	95% CI Upper limit
SAM: Arousal (1–9 scale)									
Male observers									
Intercept	3.76	.14	.01	26.41	<.001	*	Posttreatment	3.48	4.04
Treatment (Pre)	.41	.15	.23	2.76	.007		Pretreatment	3.87	4.47
Female observers									
Intercept	3.03	.18	−.39	17.21	<.001	*	Posttreatment	2.68	3.38
Treatment (Pre)	.77	.17	.42	4.47	<.001	*	Pretreatment	3.41	4.18
SAM: Dominance (1–9 scale)									
Male observers									
Intercept	5.21	.17	.21	31.32	<.001	*	Posttreatment	4.89	5.54
Treatment (Pre)	−.50	.10	−.30	−4.94	<.001	*	Pretreatment	4.40	5.02
Female observers									
Intercept	4.83	.18	−.02	27.12	<.001	*	Posttreatment	4.48	5.18
Treatment (Pre)	−.18	.09	−.11	−2.01	.052		Pretreatment	4.30	5.00

Note. *SE* = standard error; CI = confidence interval; SAM = Self-Assessment Manikin.

mation was provided about the health or background of the pictured individuals. In the instructions, participants were given an example of a face shown for 2.5 s, the length of time the subsequent faces would be shown for. They were told they would first rate "how the face made you feel" using three scales, and given instructions for completing the SAM (Lang, Bradely, & Cuthbert, 1997). They were told that they would then rate their impression of the individual on adjective pair scales and were given two examples of such scales: untrustworthy versus trustworthy and unlikeable versus likable.

Following the instructions, participants were shown one picture (either pretreatment or posttreatment) from each of the 26 sets of faces. Each face was presented for 2.5 s, as we aimed to gather participants' initial impressions of the face. After seeing a face, participants were asked, "How did the face make you feel?" and completed the corresponding SAM. Then participants were told, "For each of the following adjective pairs, please select the option which is closest to how you feel about the individual in the picture you just saw" and completed the semantic differential scales. The scales assessing personality attributes, internal attributes, and social attributes were each grouped, and the order of these groupings was randomized across trials. Participants then guessed the age and the gender of the individual (male, female, other, cannot tell).

Data Analysis

We performed linear mixed-effects analyses using the lme4 package (Version 1.1–12; Bates, Mächler, Bolker, & Walker, 2015) in R (Version 3.2.3; R Development Core Team, 2015) to characterize the relationship between each of the dependent variables (SAM measures, personality measures, internal attributes, social attributes) and treatment (pre- vs. posttreatment). This analysis allowed us to model the variation in the effect of treatment across items (i.e., faces) and across participants. We included intercepts for the random effects of items and participants and by-item and by-participant random slopes for the effect of treatment as appropriate (Barr, Levy, Scheepers, & Tily, 2013). We obtained *p* values for the parameter estimates of each model on the basis of Satterthwaite's approximation using the lmerTest package (Version 2.0–30; Kuznetsova, Brockhoff, & Christensen, 2015). Parameter estimates are reported along with their *p* values and confidence intervals, obtained using the effects package (Version 3.1–1; Fox et al., 2016). A Bonferroni-corrected *p* value served as an additional conservative criterion of significance for all models ($p < .0015$ based on a total of 33 dependent variables measured).

In addition to the main effect of interest (pre- vs. posttreatment), we also examined the effects of gender (face gender and participant gender) in secondary analyses. The online supplemental materials provide a full list of results, details of all models, as well as exploratory analyses examining differences between types of disfigurement (cancer, hyperpigmentation, paralysis, scar, swelling).

Given the large number of dependent variables, we performed a principal component analysis (PCA) to understand how they group together. Briefly, PCA is a technique to reduce multiple variables down to a small number of uncorrelated linear combinations of the variables (i.e., components) that explains the most variance in the data. Components were identified using a scree plot cutoff (eigenvalue >1, discrete drop between components).

After identifying the principal components, we then used component scores as dependent variables in linear mixed models, performed as for the raw data. These models allowed us to characterize the relationship between each of the principal components and treatment (pre- vs. posttreatment), while modeling variation across items and participants.

Results

We found that people reported higher emotional valence (i.e., more positive emotion), lower arousal, and higher dominance when viewing posttreatment than pretreatment faces, and made more positive inferences about posttreatment individuals' personality traits, internal attributes, and social attributes (see Table 1). Figure 1 provides two representative examples of pretreatment and posttreatment face ratings.

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Table 3
Fixed Effect Regression Coefficients and Standardized Coefficients for Models Estimating the Effect of Treatment (Pre- vs. Posttreament) on Internal Attribute Ratings Separately for Male and Female Observers

Internal attribute	*B*	*SE B*	β	*t*	*p*	Bonferroni corrected p value significant	Treatment	95% CI Lower limit	95% CI Upper limit
Competent (vs. Incompetent; 1–5 scale)									
Male observers									
Intercept	3.45	.09	.12	40.33	<.001	*	Posttreatment	3.28	3.62
Treatment (Pre)	−.38	.06	−.40	−6.09	<.001	*	Pretreatment	2.91	3.22
Female observers									
Intercept	3.56	.09	.24	38.86	<.001	*	Posttreatment	3.38	3.74
Treatment (Pre)	−.25	.08	−.26	−3.04	.005		Pretreatment	3.17	3.46
Intelligent (vs. Unintelligent; 1–5 scale)									
Male observers									
Intercept	3.28	.09	.06	36.83	<.001	*	Posttreatment	3.11	3.46
Treatment (Pre)	−.32	.06	−.34	−5.30	<.001	*	Pretreatment	2.80	3.13
Female observers									
Intercept	3.49	.08	.27	43.33	<.001	*	Posttreatment	3.33	3.65
Treatment (Pre)	−.21	.07	−.22	24.76	.006		Pretreatment	3.12	3.44
Hardworking (vs. Lazy; 1–5 scale)									
Male observers									
Intercept	3.43	.08	.08	45.48	<.001	*	Posttreatment	3.29	3.58
Treatment (Pre)	−.32	.07	−.34	−4.76	<.001	*	Pretreatment	2.95	3.27
Female observers									
Intercept	3.55	.08	.21	45.30	<.001	*	Posttreatment	3.40	3.71
Treatment (Pre)	−.15	.07	−.17	−2.18	.039		Pretreatment	3.24	3.55
Optimistic (vs. Pessimistic; 1–5 scale)									
Male observers									
Intercept	3.04	.14	.15	22.06	<.001	*	Posttreatment	2.77	3.31
Treatment (Pre)	−.43	.10	−.38	−4.22	<.001	*	Pretreatment	2.42	2.81
Female observers									
Intercept	3.09	.15	.20	20.67	<.001	*	Posttreatment	2.80	3.39
Treatment (Pre)	−.30	.11	−.27	−2.72	.012		Pretreatment	2.56	3.03

Note. *SE* = standard error; CI = confidence interval; SAM = Self-Assessment Manikin.

There was an interaction between treatment and participant gender for arousal and dominance ratings: Treatment (pre- vs. posttreatment) had a larger effect on females' than males' arousal ratings, and a larger effect on males' than females' dominance ratings (see Table 2). In other words, when reacting to posttreatment (vs. pretreatment) faces, females' arousal fell more than males', whereas males' dominance rose more than females'.

Posttreatment individuals were judged as having more positive personality traits than pretreatment individuals. They were rated as more conscientious, emotionally stable, open to experiences, and extraverted. They were also rated as more agreeable (more supportive). However, treatment did not reliably influence ratings of warmth (one of two measures of agreeableness).

Posttreatment individuals were judged as having more positive internal attributes: They were rated as nicer, more honest, happier, and calmer than pretreatment individuals. They were also rated as more intelligent, competent, and hardworking. There was an interaction between treatment and participant gender for ratings of how competent, intelligent, hardworking, and optimistic individuals were, with treatment having a larger effect for male than for female observers (see Table 3). There was also an interaction between treatment and face gender for ratings of sensitivity: Treatment had a marginal effect on ratings of males (who were judged to be less sensitive pretreatment than posttreatment) but not females (see Table 4). Not all ratings varied by treatment. For example, ratings of how uptight individuals were did not vary.

Posttreatment individuals were judged as having more positive social attributes than pretreatment individuals. They were rated as more trustworthy, likable, popular, and confident, among others. There was an interaction between treatment and face gender for ratings of dominance: Treatment had an effect on ratings of females (pretreatment females were judged to be less dominant than posttreatment females) but not on ratings of males (see Table 4).

Finally, ratings of attractiveness, which served as a manipulation check, followed the expected pattern: Posttreatment individuals were judged as being more attractive than pretreatment individuals (see Table 1).

Given the large number of ratings that observers made, PCA was used to reduce these variables into components made up of combinations of these variables. The PCA yielded a five-component solution that accounted for most of the data variance. The components and their loadings are listed in Table 5. Loadings of the individual variables onto each of the five components represent how strong the relationship is between the variables and the components.

Our interpretations of the components are as follows: Component 1, accounting for the largest proportion of variance, reflects how sociable and happy individuals appear to observers; Component 2 reflects how dominant individuals appear; Component 3 reflects how driven, rigid, and conscientious individuals appear; Component 4 reflects how emotionally stable individuals appear;

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Table 4
Fixed Effect Regression Coefficients and Standardized Coefficients for Models Estimating the Effect of Treatment (Pre- vs. Posttreament) on Social Attribute Ratings Separately for Male and Female Faces

Social attribute	*B*	*SE B*	β	*t*	*p*	Bonferroni corrected p value significant	Treatment	95% CI Lower limit	95% CI Upper limit
Sensitive (1–5 scale)									
Male faces									
Intercept	3.17	.11	.04	29.48	<.001	*	Posttreatment	2.96	3.38
Treatment (Pre)	−.26	.12	−.26	−2.22	.051		Pretreatment	2.67	3.14
Female faces									
Intercept	3.17	.10	.04	30.70	<.001	*	Posttreatment	2.97	3.37
Treatment (Pre)	−.01	.08	−.01	−.09	.933		Pretreatment	2.99	3.33
Dominant (1–5 scale)									
Male faces									
Intercept	3.00	.13	.16	22.76	<.001	*	Posttreatment	2.74	3.26
Treatment (Pre)	.04	.08	.04	.51	.629		Pretreatment	2.80	3.27
Female faces									
Intercept	2.92	.09	.08	34.28	<.001	*	Posttreatment	2.75	3.08
Treatment (Pre)	−.37	.07	−.36	−5.33	<.001	*	Pretreatment	2.42	2.67

and Component 5 reflects the degree to which the individuals appear to be an object of curiosity.

We assessed the effect of treatment on these components' scores (see Table 6). Posttreatment individuals appeared more sociable and happy, more dominant, and more emotionally stable to observers than did pretreatment individuals. Treatment did not have a reliable effect on how driven individuals appeared. Finally, posttreatment individuals were less likely to appear as an object of curiosity than pretreatment individuals.

Discussion

Results of the present study confirmed the hypothesis of a disfigured-is-bad stereotype. Observers judged pretreatment individuals more negatively, perceiving them as having less desirable personality traits (e.g., emotional stability, conscientiousness), internal attributes (e.g., happiness, intelligence), and social attributes (e.g., trustworthiness, popularity). Moreover, observers reported different emotional reactions—lower valence, higher arousal, and lower dominance—when looking at pre- than posttreatment faces. However, not all judgments were influenced by disfigurement. For example, people did not rate pre- and posttreatment individuals differently on how uptight or sensitive they were.

Results of a PCA revealed that these various judgments grouped into five components, with four of them affected by treatment (pre- vs. posttreatment). Prior to treatment, individuals were judged by raters as less sociable and happy, less dominant, and less emotionally stable than they were after treatment. In addition, prior to treatment individuals were more likely to appear as an object of curiosity to observers compared with after treatment.

Interestingly, judgments of attractiveness did not significantly contribute to any of the five major categories of variables. If emotional responses and other inferences were driven by observers' judgments of how attractive individuals appeared, then a dominant grouping around attractiveness would be expected. Instead, attractiveness judgments were weakly related to the components that emerged. This suggests that the negative way in which people with facial disfigurements are perceived by others is not because of lower attractiveness but because of the judgments of the disfigurement.

Under specific circumstances, disfigurement and attractiveness may even dissociate. For example, mild facial scarring can enhance men's attractiveness as potential partners for women's short-term relationships, perhaps because the scarring acts as a signal of risk-taking (Burriss, Rowland, & Little, 2009). However, in the case of more severe disfigurement, as in the current study, perceived attractiveness was correspondingly lower for the disfigured faces than those who were treated.

The emotional responses, negative stereotypes, and curiosity toward facial disfigurement observed in this study could contribute to the academic, professional, and social discrimination experienced by people with facial disfigurement (Rumsey & Harcourt, 2004; Sarwer et al., 1999; Thompson & Kent, 2001). In academic settings, facially disfigured students might be viewed as less intelligent and less hardworking than their non-disfigured classmates, leading to lower estimates of performance. Other students may view them as submissive and as objects of curiosity, leading to bullying. In professional settings, disfigured workers might be judged to be less competent, reliable, and sociable, leading to a lower likelihood of getting hired or promoted. In social settings, disfigured people might be viewed as less likable, nice, and trustworthy, leading to difficulties making friends and finding romantic partners. In public, observers might experience high arousal and low valence in response to the disfigurement, leading them to avoid the person to lessen their own discomfort.

The effect of observer gender and face gender on reactions to disfigurement was also assessed. Women's self-reported feelings of arousal were more affected by disfigurement than men's, in line with previous findings that women tend to react with higher arousal to emotional stimuli (Bradley et al., 2001). On the other hand, men's self-reported feelings of dominance were more affected by disfigurement than women's.

In terms of inferences made on the basis of disfigurement, we found that men were more biased than women in judging how

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Table 5
PCA on All Dependent Variables Measured Yielded a Five-Component Solution

Component	Variable	Loading
PC1: Sociable, Happy		
Accounts for 47.07% of variance	Likeable	.22
	Content	.22
	Optimistic	.21
	Warm person	.21
	Happy	.21
	Nice	.20
	Supportive	.20
	Popular	.20
	Stable	.19
	Connected	.19
	Trustworthy	.19
	Open	.19
	Competent	.19
	Reliable	.18
	Honest	.18
	Creative	.18
	Attractive	.18
	Interesting	.18
	Intelligent	.17
	Valence (viewer)	.17
	Confident	.17
	Energetic	.16
	Extraverted	.16
	Sensitive	.16
	Outgoing	.16
	Hardworking	.15
	Careful	.14
	Dominance (viewer)	.08
	Dominant	.02
	Arousal (viewer)	−.04
	Anxious	−.13
	Uptight	−.14
	Angry	−.16
PC2: Dominant		
Accounts for 8.86% of variance	Dominant	.38
	Outgoing	.35
	Extraverted	.34
	Confident	.28
	Connected	.23
	Happy	.17
	Angry	.17
	Energetic	.16
	Valence (viewer)	.15
	Popular	.14
	Open	.11
	Attractive	.10
	Arousal (viewer)	.06
	Optimistic	.06
	Uptight	.05
	Interesting	.02
	Dominance (viewer)	.01
	Content	.01
	Creative	.00
	Stable	−.04
	Anxious	−.04
	Intelligent	−.10
	Competent	−.10
	Likeable	−.10
	Warm person	−.12
	Supportive	−.12
	Hardworking	−.14
	Nice	−.18
	Reliable	−.19
	Trustworthy	−.19
	Careful	−.21
	Honest	−.22
	Sensitive	−.22
PC3: Driven, Rigid, Conscientious		
Accounts for 6.12% of variance	Uptight	.40
	Dominant	.34
	Hardworking	.33
	Intelligent	.31
	Careful	.29
	Competent	.29
	Anxious	.23
	Angry	.22
	Reliable	.20
	Confident	.13
	Energetic	.12
	Honest	.12
	Interesting	.12
	Trustworthy	.10
	Stable	.09
	Arousal (viewer)	.08
	Extraverted	.00
	Dominance (viewer)	.00
	Attractive	−.02
	Connected	−.02
	Popular	−.03
	Outgoing	−.03
	Valence (viewer)	−.05
	Likeable	−.05
	Creative	−.05
	Sensitive	−.07
	Open	−.09
	Happy	−.11
	Optimistic	−.12
	Content	−.13
	Nice	−.13
	Warm person	−.14
	Supportive	−.15
PC4: Emotionally Stable		
Accounts for 3.65% of variance	Stable	.15
	Confident	.15
	Hardworking	.12
	Dominant	.11
	Valence (viewer)	.11
	Reliable	.10
	Competent	.08
	Careful	.05
	Intelligent	.05
	Connected	.04
	Happy	.03
	Content	.03
	Honest	.01
	Optimistic	.00
	Trustworthy	−.02
	Popular	−.04
	Extraverted	−.05
	Attractive	−.05
	Outgoing	−.06
	Nice	−.08
	Likeable	−.09
	Uptight	−.09
	Supportive	−.10
	Dominance (viewer)	−.11
	Warm person	−.11
	Creative	−.12
	Energetic	−.14
	Open	−.16
	Angry	−.18

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Component	Variable	Loading
	Interesting	−.22
	Sensitive	−.25
	Anxious	−.38
	Arousal (viewer)	−.69
PC5: Object of Curiosity		
Accounts for 3.15% of variance	Creative	.17
	Arousal (viewer)	.17
	Interesting	.10
	Hardworking	.07
	Reliable	.07
	Popular	.06
	Angry	.06
	Open	.05
	Dominant	.05
	Honest	.05
	Warm person	.04
	Outgoing	.03
	Supportive	.03
	Intelligent	.03
	Optimistic	.03
	Energetic	.02
	Connected	.02
	Confident	.02
	Competent	.02
	Likeable	.01
	Extraverted	.01
	Nice	.00
	Trustworthy	−.01
	Content	−.02
	Stable	−.02
	Happy	−.06
	Careful	−.06
	Attractive	−.09
	Sensitive	−.10
	Uptight	−.12
	Anxious	−.22
	Valence (viewer)	−.33
	Dominance (viewer)	−.83

Note. Loadings of the individual variables onto each of the five components represent how strong the relationship is between the variables and the components. PCA = principle components analysis.

intelligent, competent, hardworking, and optimistic people with disfigurements were. This new finding suggests that men's reactions to disfigurement may be harsher than women's. This observation has implications for professional advancement, because men often make hiring and advancement decisions and these traits are valued in workers.

In addition, the effect that the gender of the pictured individuals had on observers' reactions was assessed. Men's perceived sensitivity was more affected by disfigurement than women's, whereas women's perceived dominance was more affected by disfigurement than men's. If women with disfigurement are treated as submissive (i.e., not dominant) by others, this may contribute to their greater distress that has been observed in previous studies (e.g., Carr et al., 2000).

Why might a disfigurement-is-bad stereotype exist? One possibility is the converse of the beauty-is-good stereotype. Evolutionary arguments suggest that features associated with beauty, such as symmetry, are markers for health and confer a reproductive advantage (Chatterjee, 2014; Grammer, Fink, Møller, & Thornhill, 2003; Thornhill & Gangestad, 1999). By analogy, disfigurement might advertise compromised health, even when irrelevant as in acquired cases, and contribute to an implicit bias that disfigurement is bad. This idea is supported by findings that disease priming can lead to increased attention to and avoidance of disfigured individuals, even if the disfigurement is not of a type that could be contagious (Ackerman et al., 2009; Miller & Maner, 2011).

Models of disability, of which disfigurement may be considered a subtype (e.g., Americans With Disabilities Act, 1990; Equality Act, 2010), can help inform approaches and solutions to the discrimination faced by people with facial disfigurement. Two alternative models used to understand the impact of disability are the medical model and the social model (Barnes & Mercer, 2003). Under the medical model, disability is conceived of as an individual issue, a "personal tragedy," which should be addressed through individual treatment interventions. A newer model, the social model, posits that disability is a societal problem, because society fails to accommodate everyone, including people with disabilities. Under this model, disability should be addressed by increasing societal acceptance and adaptability.

Applying these models to disfigurement (Wardle, Boyce, & Barron, 2009), the medical model solution is corrective surgery or other treatments to reduce the appearance of disfigurement, whereas the social model solution is a change in societal attitudes and behaviors toward people with disfigurement. The current findings support the importance of both types of interventions.

The individuals pictured and rated by observers in the study were either shown before or after an intervention to minimize their disfigurement. Observers perceived them more positively after the intervention, suggesting that surgical interventions of facial disfigurements have a therapeutic effect that is more than skin-deep.

Previous research suggests that the relationship between people's severity of disfigurement and psychological adjustment is nonlinear: People with moderate disfigurement appear to have more difficulty adjusting than people with mild or severe disfigurement (Moss, 2005). Why is this the case? One explanation may be that people with mild or severe disfigurement are likely to experience consistent reactions from others (Moss, 2005; Rumsey & Harcourt, 2004). People with mild disfigurement are unlikely to experience strong negative reactions, whereas people with severe disfigurement are likely to experience strong negative reactions (e.g., staring, comments) in nearly every interaction. If others' reactions are consistent, people can develop adaptive strategies to adjust to them. However, moderate-severity disfigurement can provoke a range of reactions that varies among observers. This lack of consistency is stressful and makes it difficult for the person with disfigurement to establish any adaptive strategies. Given this, individuals who have moderate facial disfigurement may be most helped by surgical or other interventions because they are most at risk of experiencing a variety of negative reactions from others. The current findings suggest that others' reactions could be less negative after treatment, helping to provide consistency across social interactions.

In addition to surgical or other treatment, counseling may help people with disfigurement adjust and learn techniques to effectively deal with the public (e.g., McGrouther, 1997). The way that people with disfigurement interact with others can affect the way that others will react to them (e.g., Edwards et al., 2011; Rumsey & Harcourt, 2004).

At the level of society, interventions could be designed to minimize the public's negative reactions to disfigurement. Interventions could specifically target the negative stereotypes of dis-

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Table 6
Fixed Effect Regression Coefficients and Standardized Coefficients for Models Estimating the Effect of Treatment (Pre- vs. Posttreament) on Principal Component (PC) Scores

Principal component	*B*	*SE B*	*t*	*p*	Treatment	95% CI Lower	95% CI Upper
PC1: Sociable, Happy							
Intercept	.90	.55	1.66	.109	Posttreatment	−.17	1.98
Treatment (Pre)	−1.76	.39	−4.50	<.001	Pretreatment	−1.61	−.10
PC2: Dominant							
Intercept	.26	.15	1.78	.085	Posttreatment	−.03	.55
Treatment (Pre)	−.53	.14	−3.90	<.001	Pretreatment	−.58	.05
PC3: Driven, Rigid, Conscientious							
Intercept	.07	.13	.54	.595	Posttreatment	−.19	.33
Treatment (Pre)	−.15	−.09	−1.58	.124	Pretreatment	−.25	.10
PC4: Emotionally Stable							
Intercept	.24	.07	3.38	.001	Posttreatment	.10	.37
Treatment (Pre)	−.46	.07	−6.18	<.001	Pretreatment	−.41	−.05
PC5: Object of Curiosity							
Intercept	−.15	.08	−1.87	.067	Posttreatment	−.31	.01
Treatment (Pre)	.31	.06	5.15	<.001	Pretreatment	.01	.30

figurement revealed by the current research. In particular, portrayals of disfigured individuals who are intelligent, hardworking, and competent in academic and professional settings, and nice, likable, and trustworthy in social settings could help counter negative biases toward disfigurement.

Media portrayals of disfigurement may be an avenue to challenge common negative stereotypes and encourage more positive reactions from the public. Popular media frequently portray people with disfigurement negatively, often as associated with evil, as reclusive, and bitter toward others (e.g., Croley, Reese, & Wagner, 2017; Wardle, Boyce, & Barron, 2009). In fictional accounts, negative stereotypes are used as plot devices (e.g., someone with facial disfigurements becomes a villain). Well-known examples include Darth Vader from Star Wars, Lord Voldemort from Harry Potter, Scar from The Lion King, Joker and Two-Face from Batman, and the majority of villains from James Bond.

In nonfiction accounts, people with disfigurement frequently appear as an object of others' voyeuristic gaze (Wardle, Boyce, & Barron, 2009), for example, in "shock docs," which feature unusual and severe medical conditions. In contrast, the prejudice experienced by those with disfigurement is typically not addressed. Media portrayals of minority groups can influence the stereotypes that viewers hold of these groups (Greenberg & Brand, 1994). Audience research suggests that people believe TV impacts the public's attitudes about disfigurement and that more everyday representations of disfigured individuals should be featured (Wardle, Boyce, & Barron, 2009).

Viewing positive media portrayals of people with disabilities in movies and on TV is associated with fewer negative emotions when encountering people with disabilities and a greater understanding of discrimination against them (Farnall & Smith, 1999). Likewise, positive media portrayals of people with facial disfigurements may help viewers challenge previously held negative stereotypes and react with empathy toward people with disfigurement in real life. In particular, reality TV may be well suited to show real interactions that people with disfigurement have with others and to introduce unique, positive portrayals of people with disfigurement (Wardle, Boyce, & Barron, 2009).

Conclusion

The current research revealed that, in everyday aesthetic judgments, the emotional responses to and negative stereotypes of people with facial disfigurement may drive discrimination in social, academic, and professional contexts. People with disfigurement are perceived as having less desirable personality traits (e.g., emotional stability, conscientiousness), internal attributes (e.g., happiness, intelligence), and social attributes (e.g., trustworthiness, popularity). These subjective judgments further reduced to people with disfigurement being regarded as less sociable and happy, less dominant, less emotionally stable, and more as objects of curiosity. Future interventions based on countering these stereotypes may improve the way that people with disfigurement are treated by others.

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